European Geosciences Union
Geosciences Information for Teachers
Cape Town, 30 August – 1st September 2017

Bounded by Oceans

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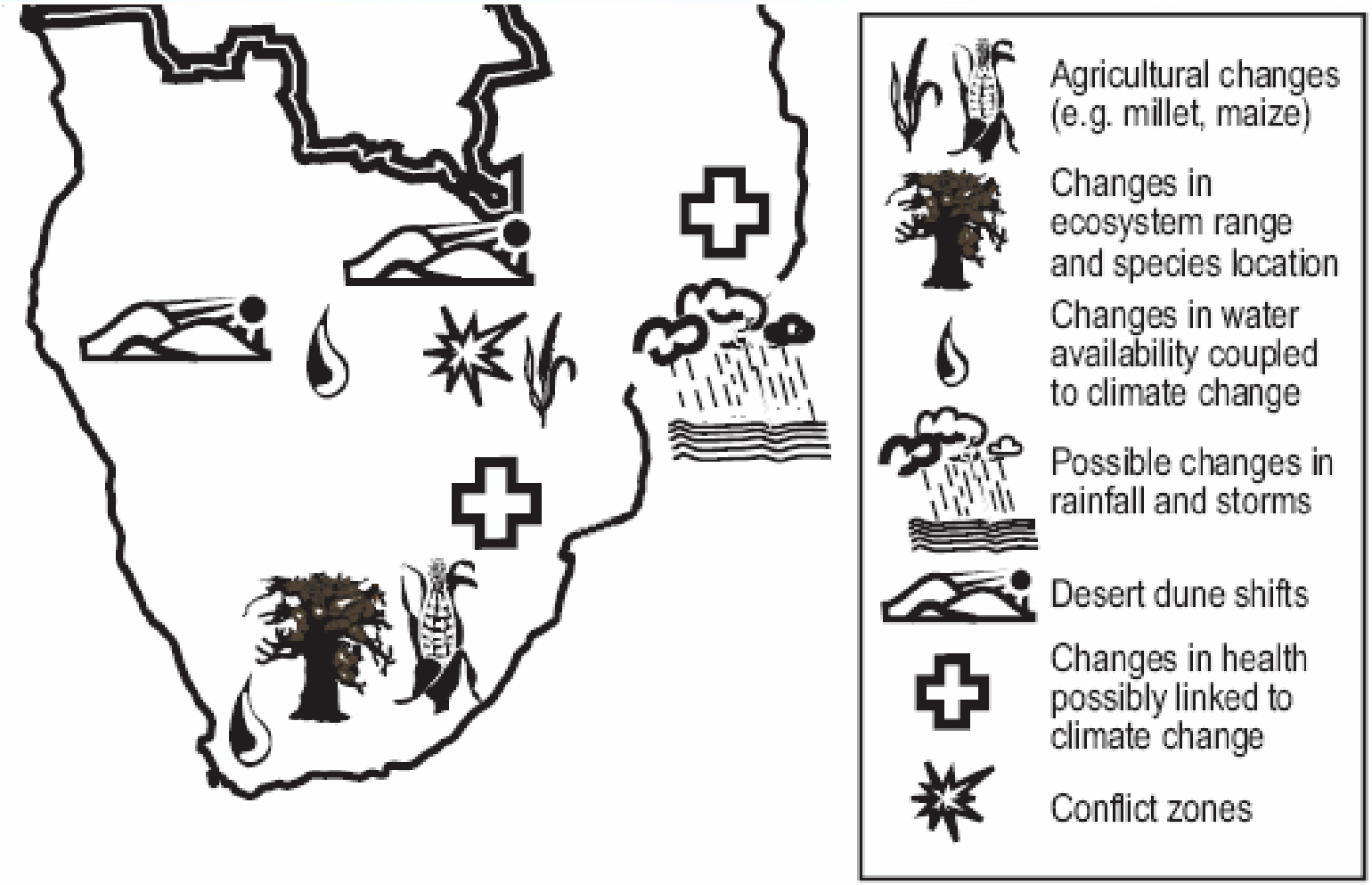
Why do we need to study the oceans around South

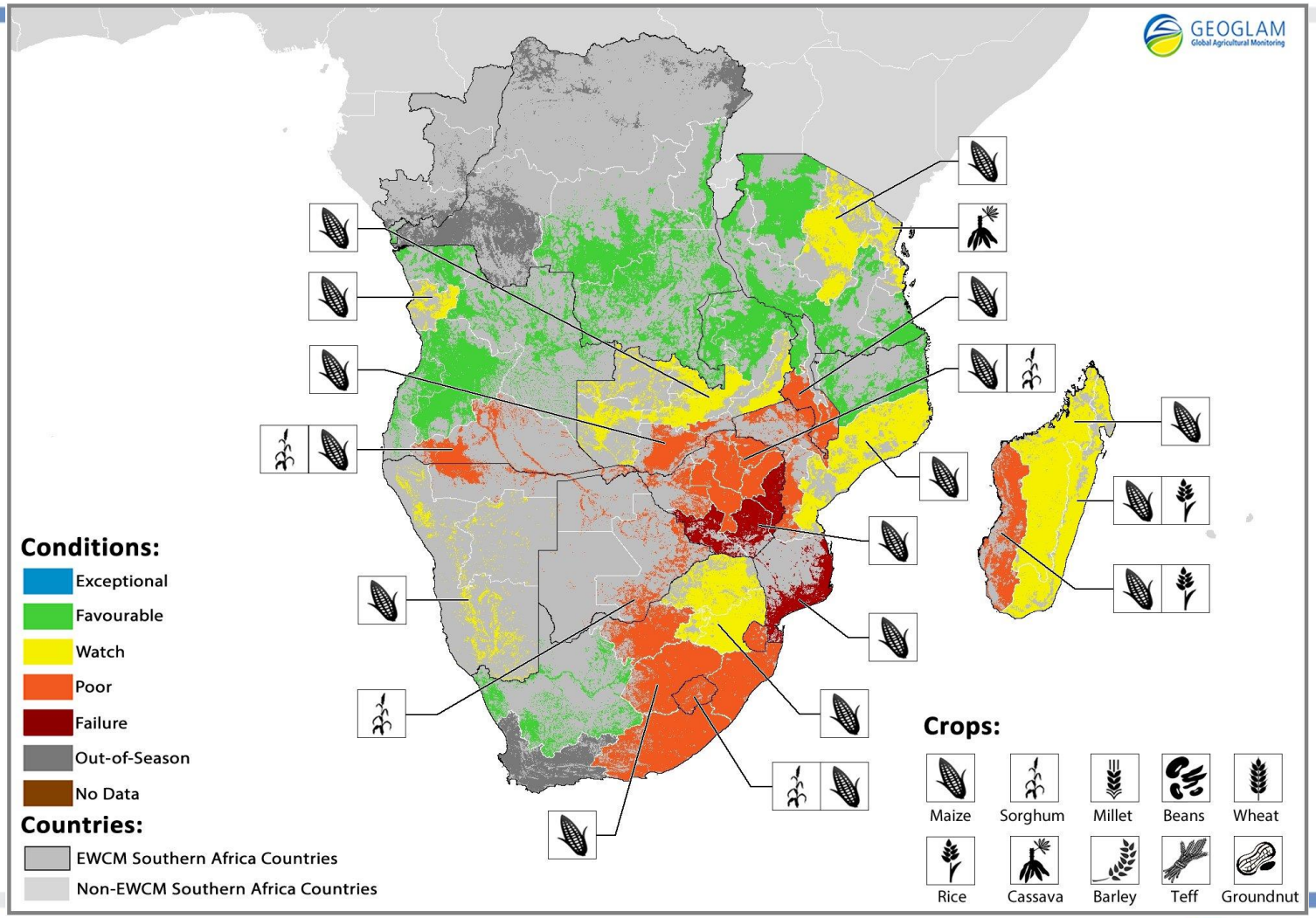
http://uhfall2014southafrica.blogspot.co.za/

Possible changes to Southern Africa due to Climate Change



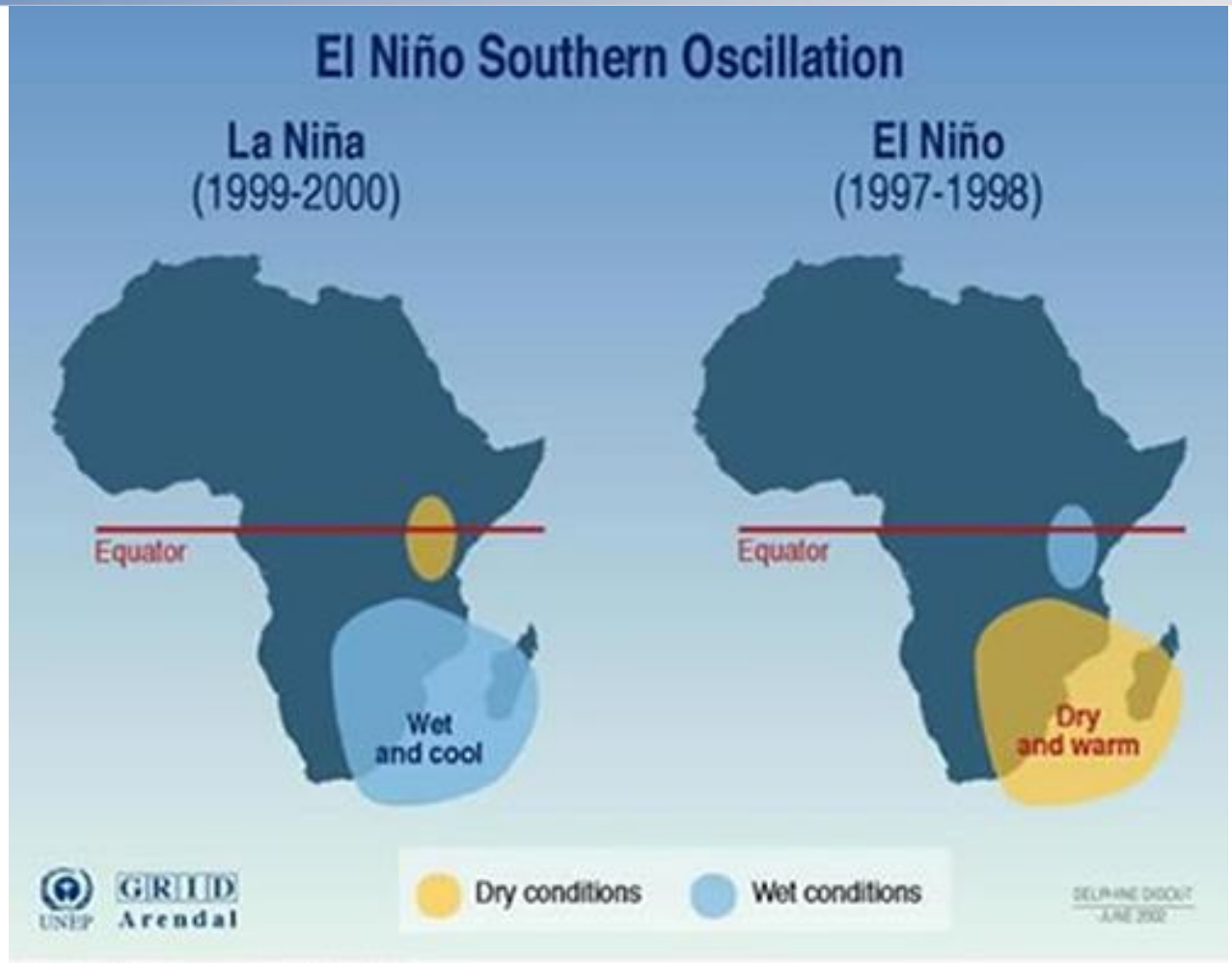
http://media.csag.uct.ac.za/faq/qa_3impacts.html

Resultant impacts on Southern African harvests and food security



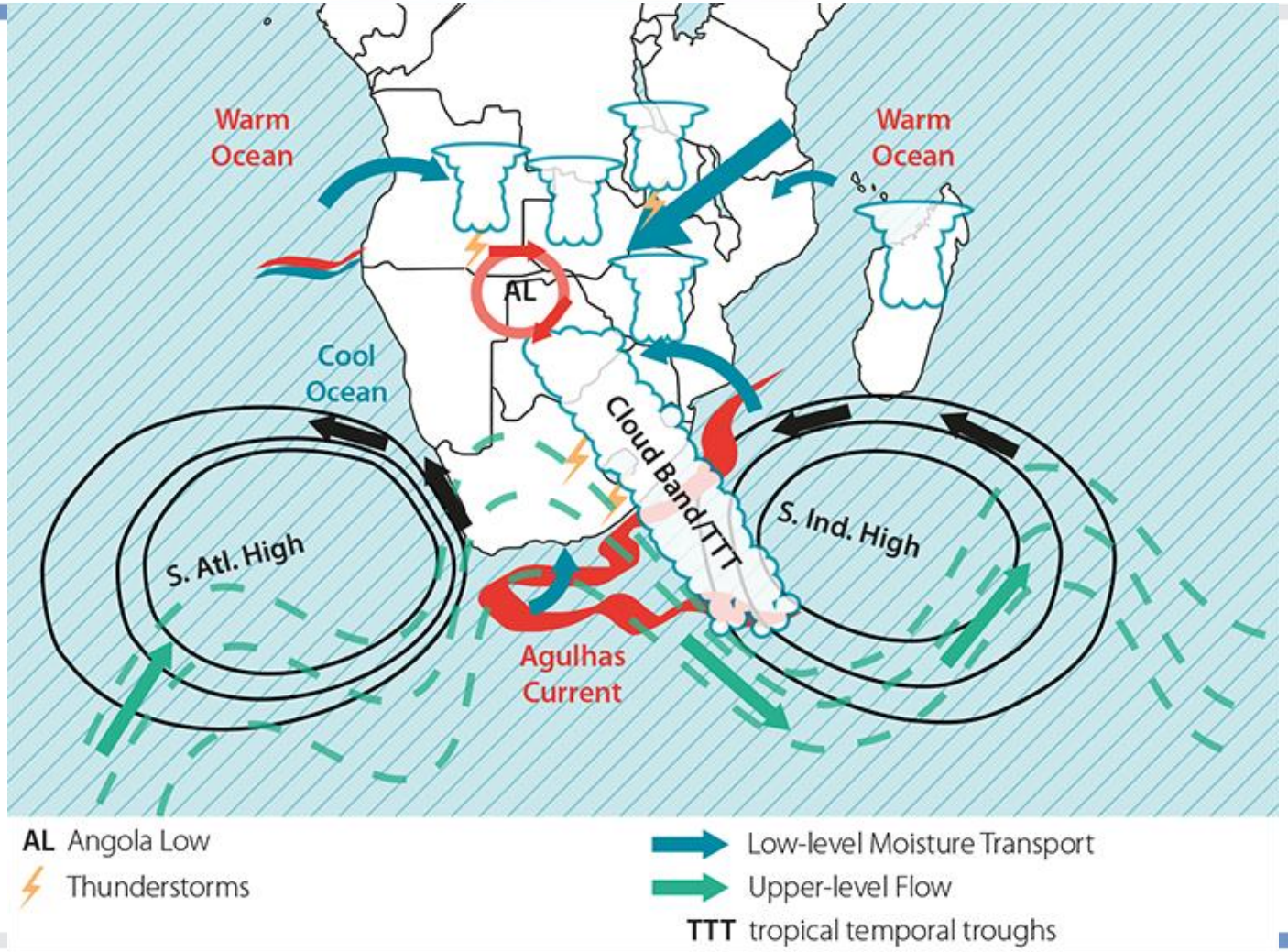
https://ec.europa.eu/jrc/en/news/el-nino-devastating-impact-southern-africa-harvests-and-food-security

Effects of the El Niño Southern Oscillation on rainfall in Southern Africa



Sources: Climate Prediction Center-NCEP

Rainfall pattern over the Agulhas Current



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http://2016report.futureclimateafrica.org/reader/central-and-southern-africa/regional-overview-studying-variability-and-future-change/#2-large-timeframes-great-distances-why-climate-modelling-is-difficult

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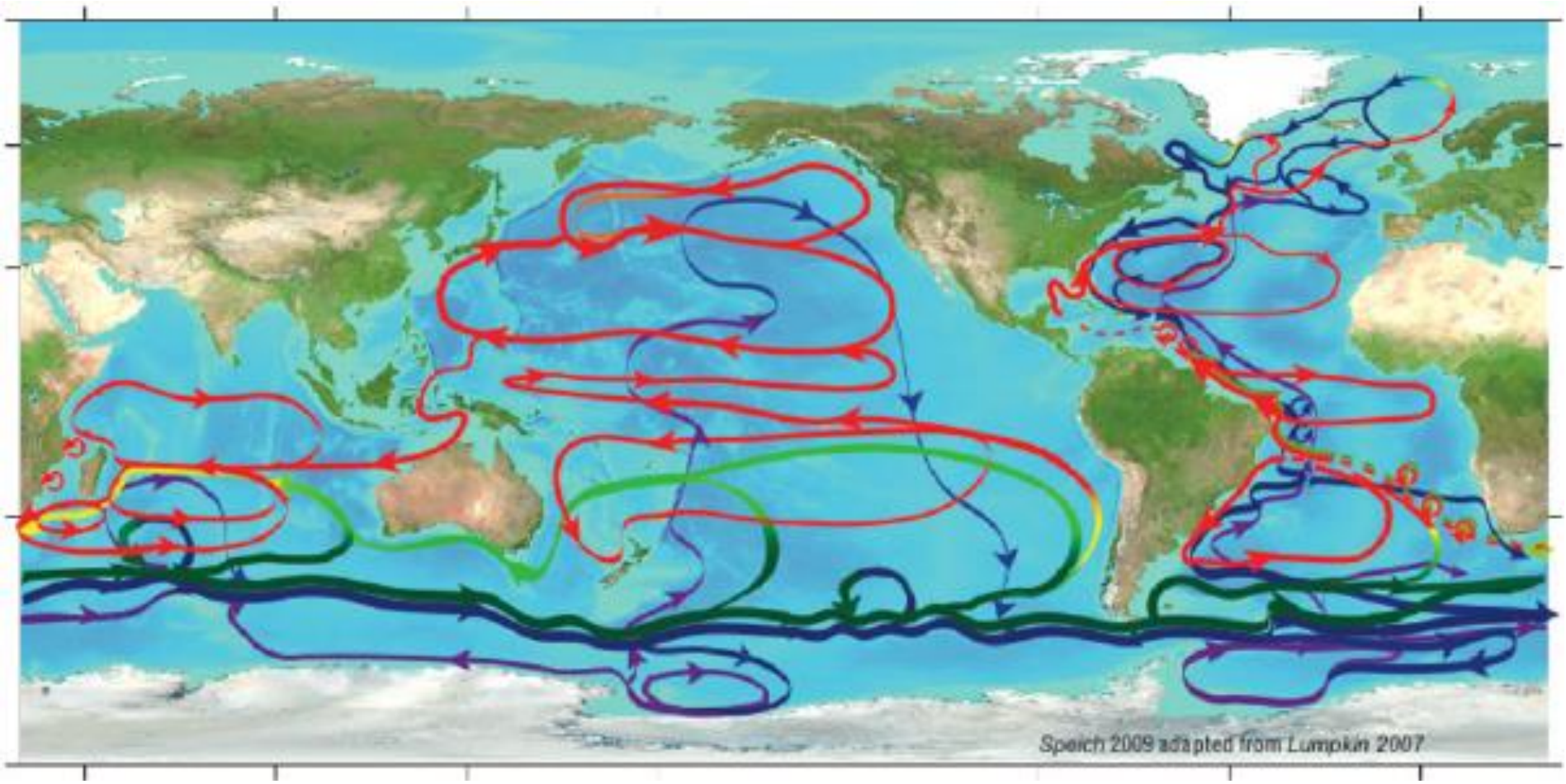
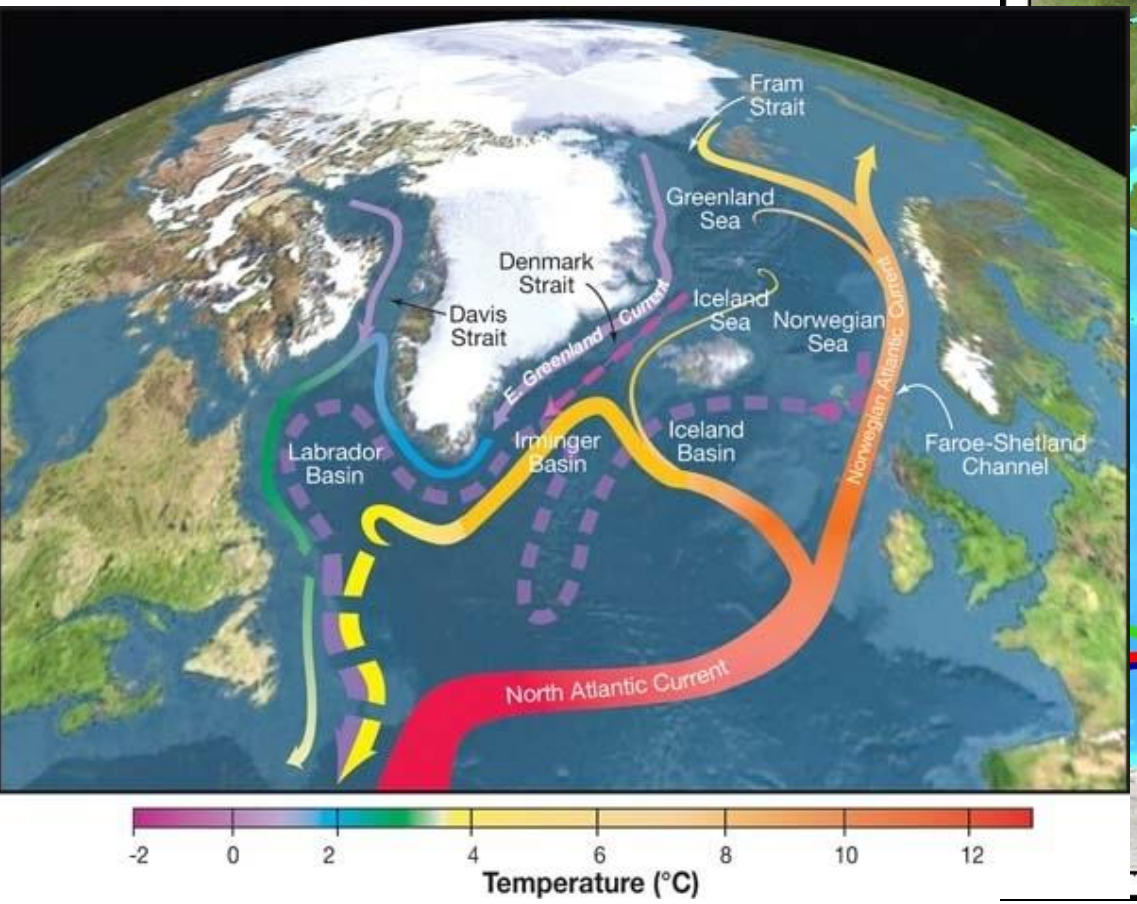
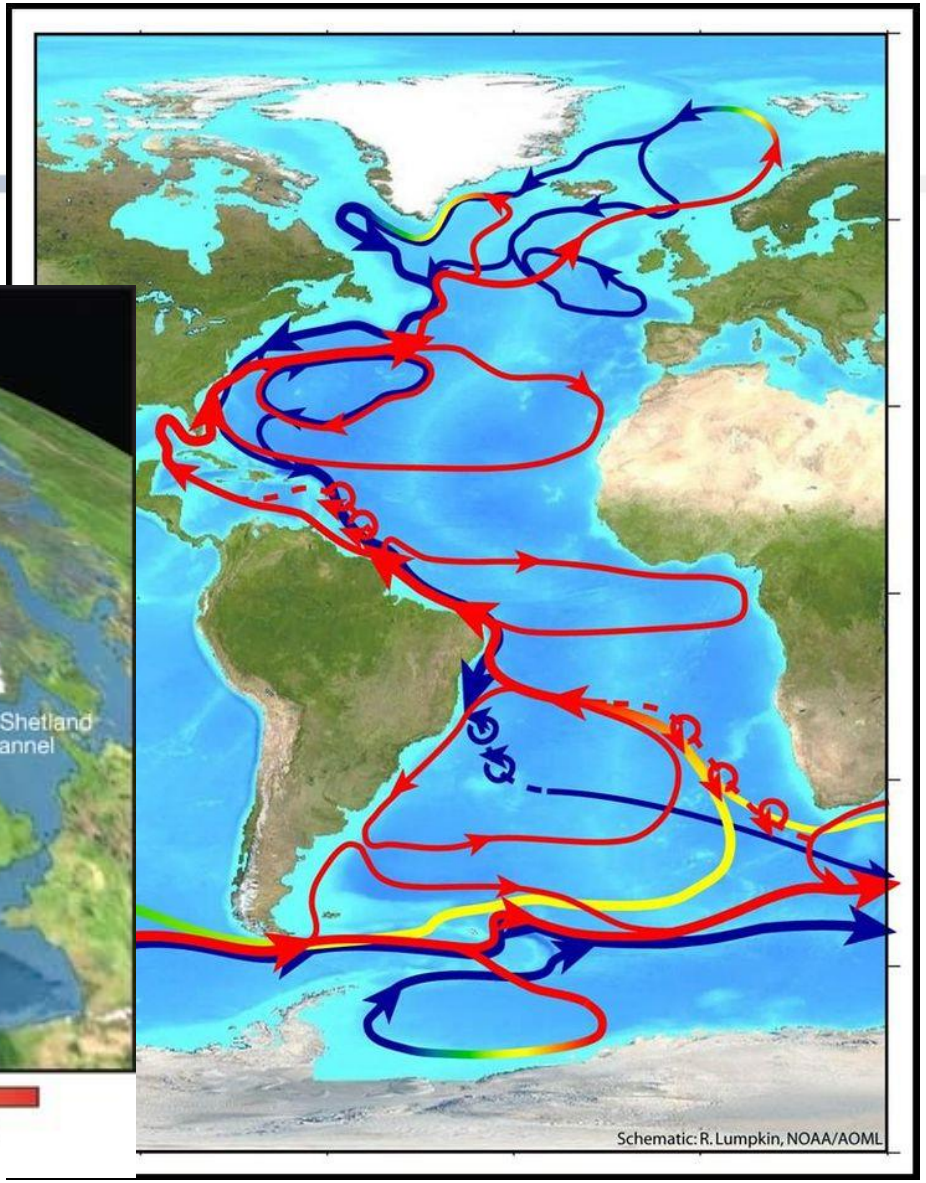
Thermohaline Circulation - Global



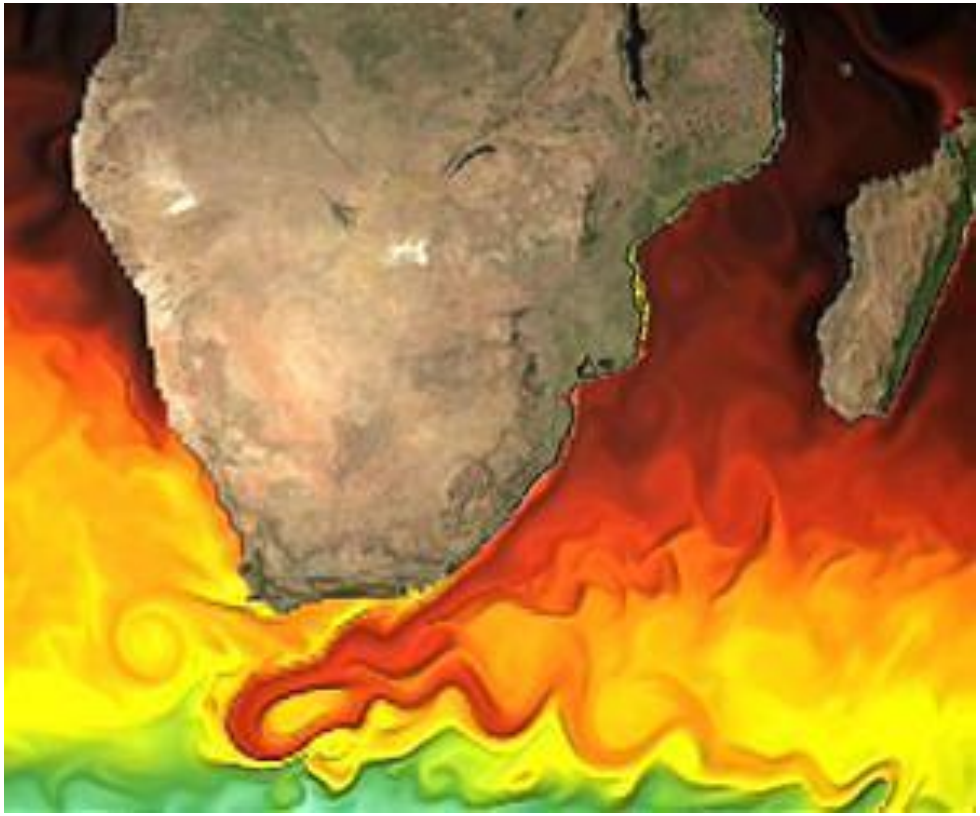
Perez et al., 2011

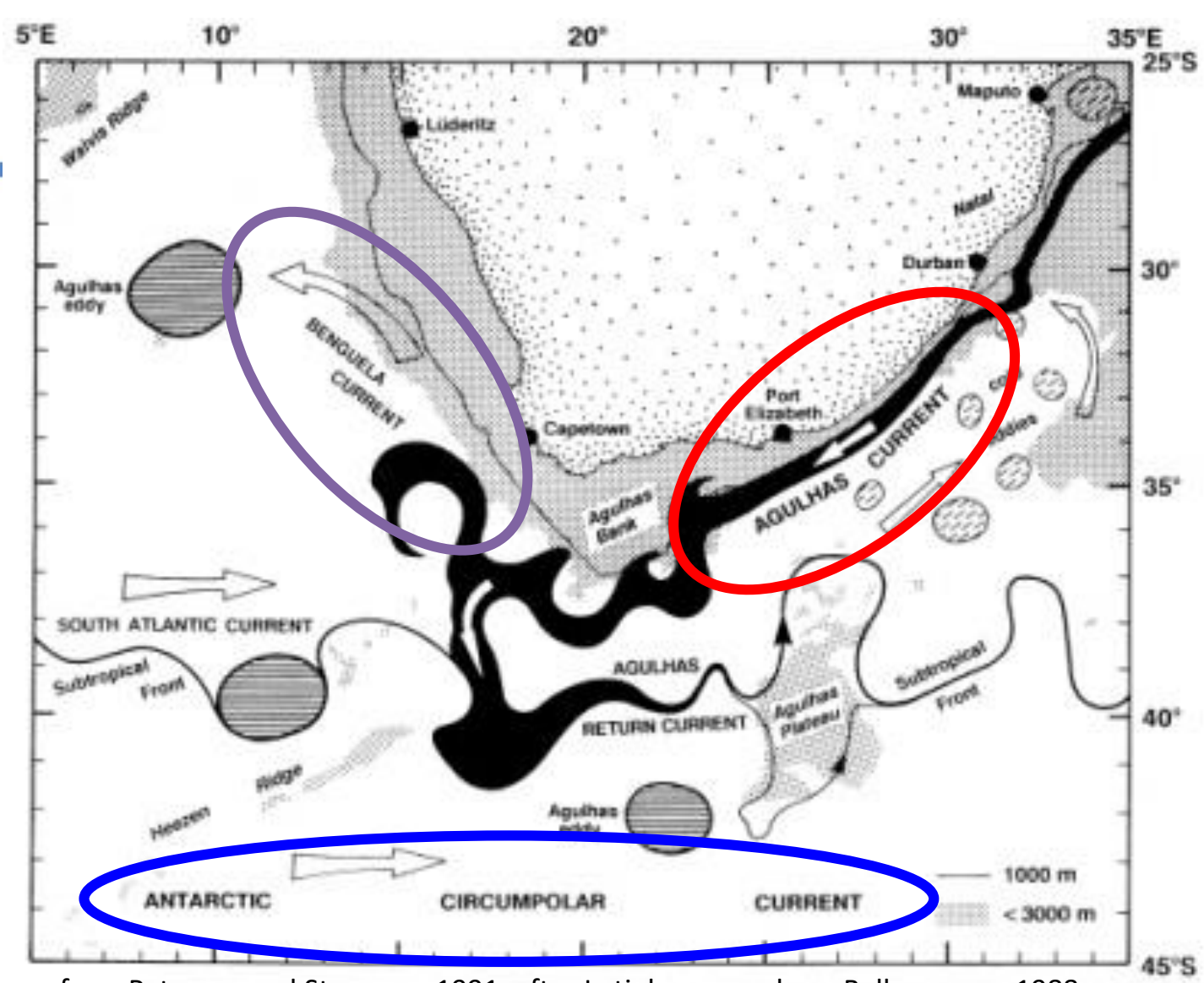
Thermohaline Circulation
Atlantic Ocean





The ocean currents around South Africa





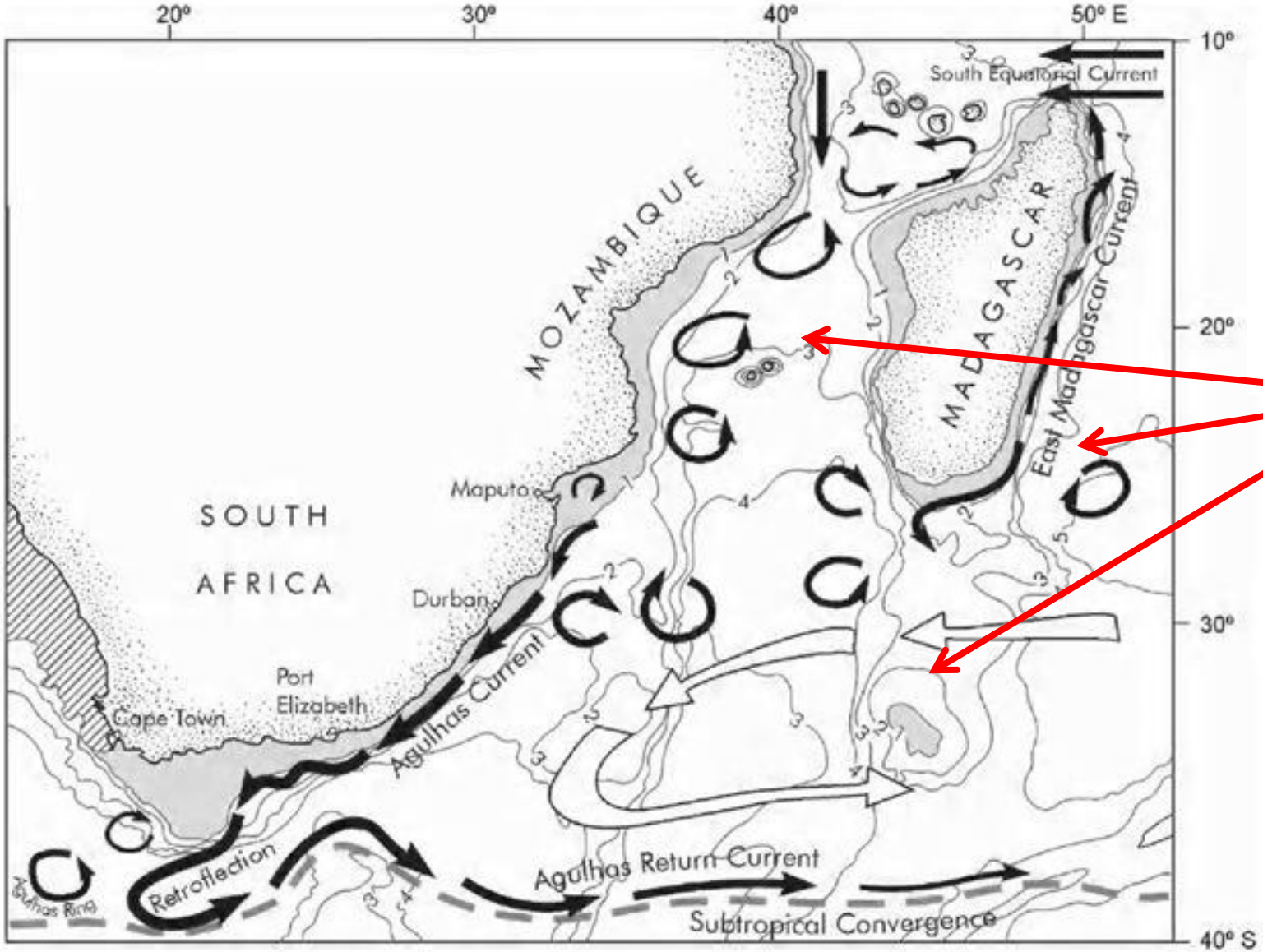
from Peterson and Stramma, 1991; after Lutjeharms and van Ballegooyen, 1988

Three major currents:

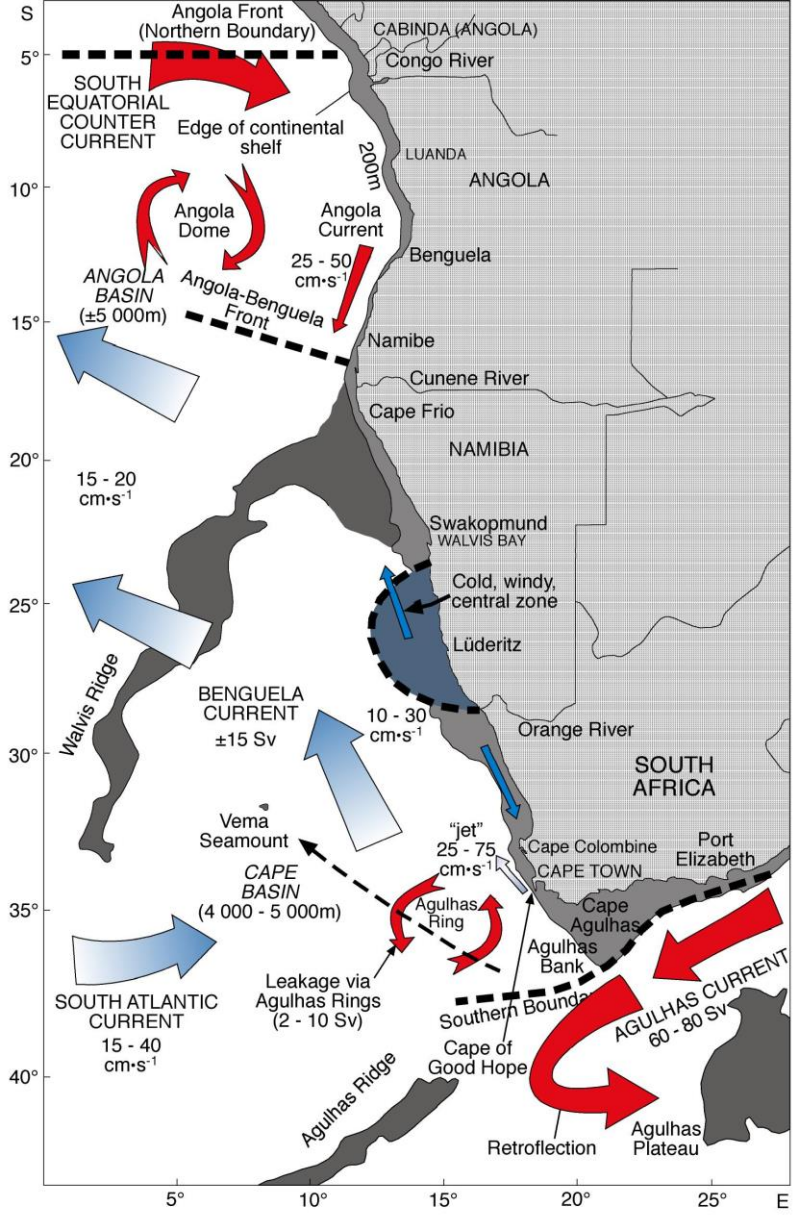
AGULHAS

BENGUELA

ANTARCTIC CIRCUMPOLAR

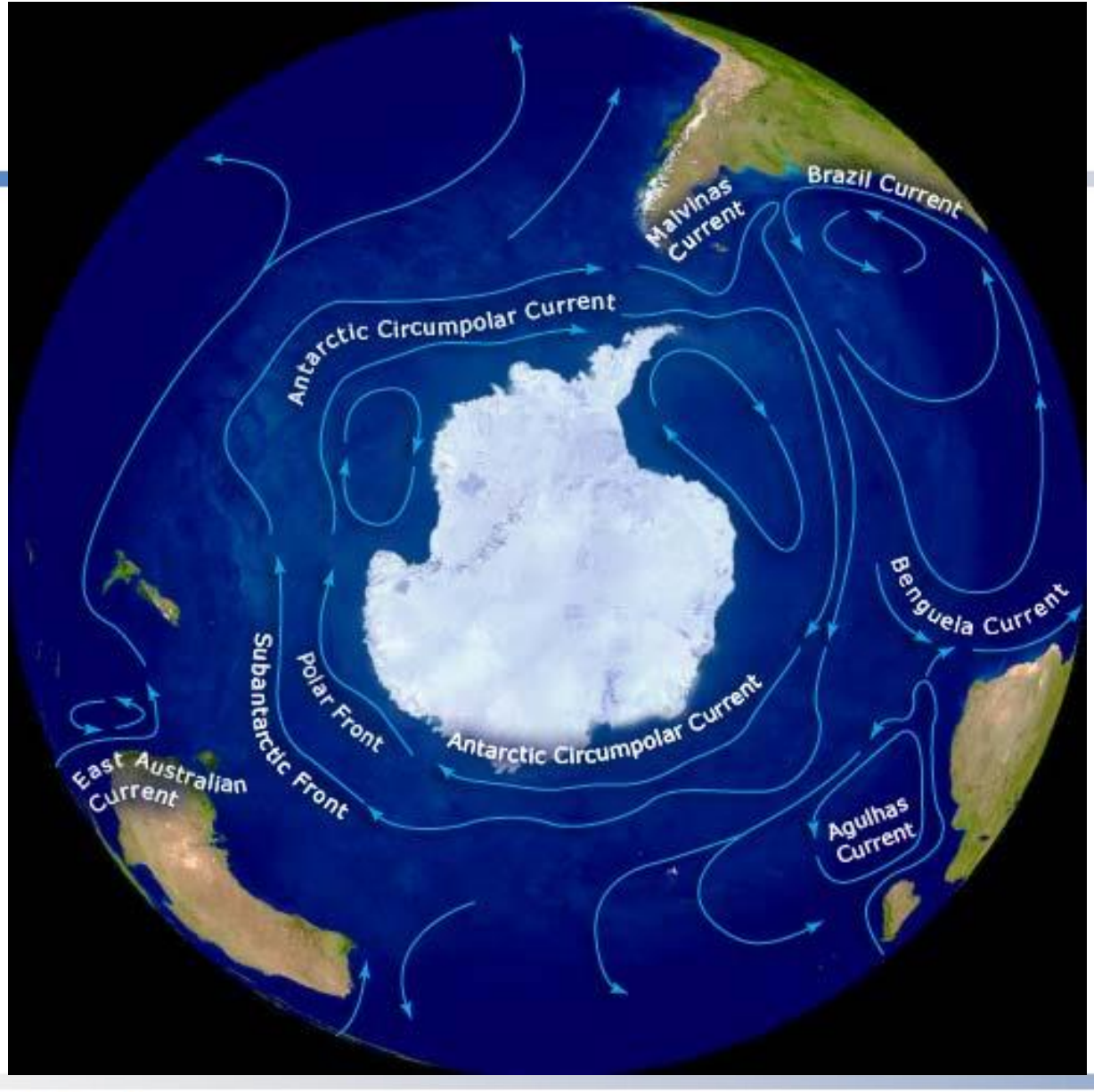


The Agulhas Current and source waters



The Benguela Current and associated dynamics

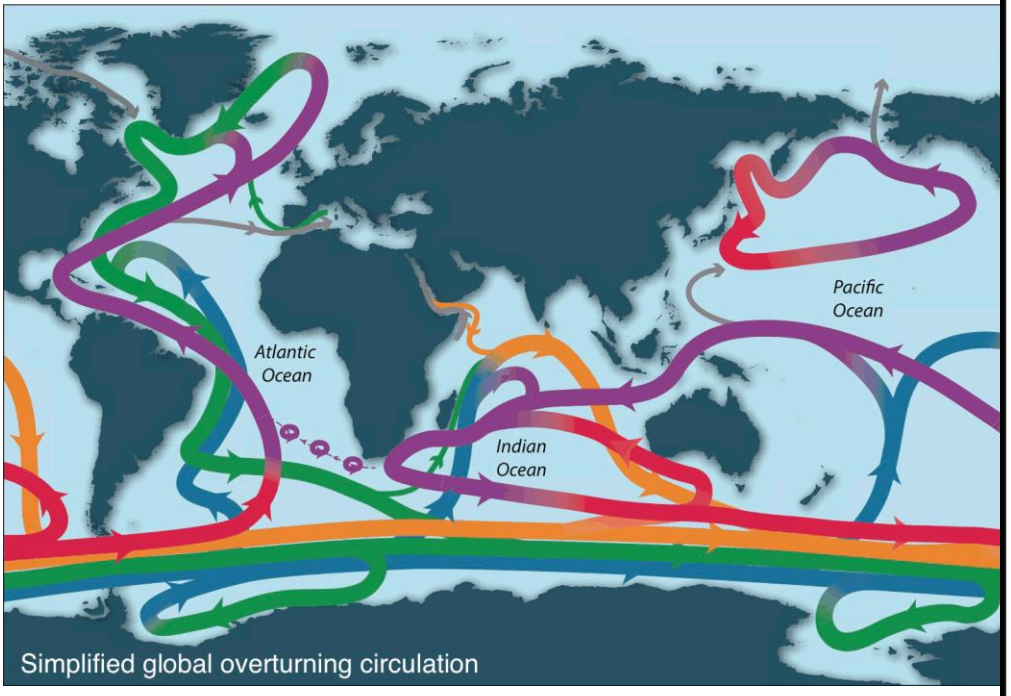
http://projects.inweh.unu.edu/inweh/display.php?ID=3527

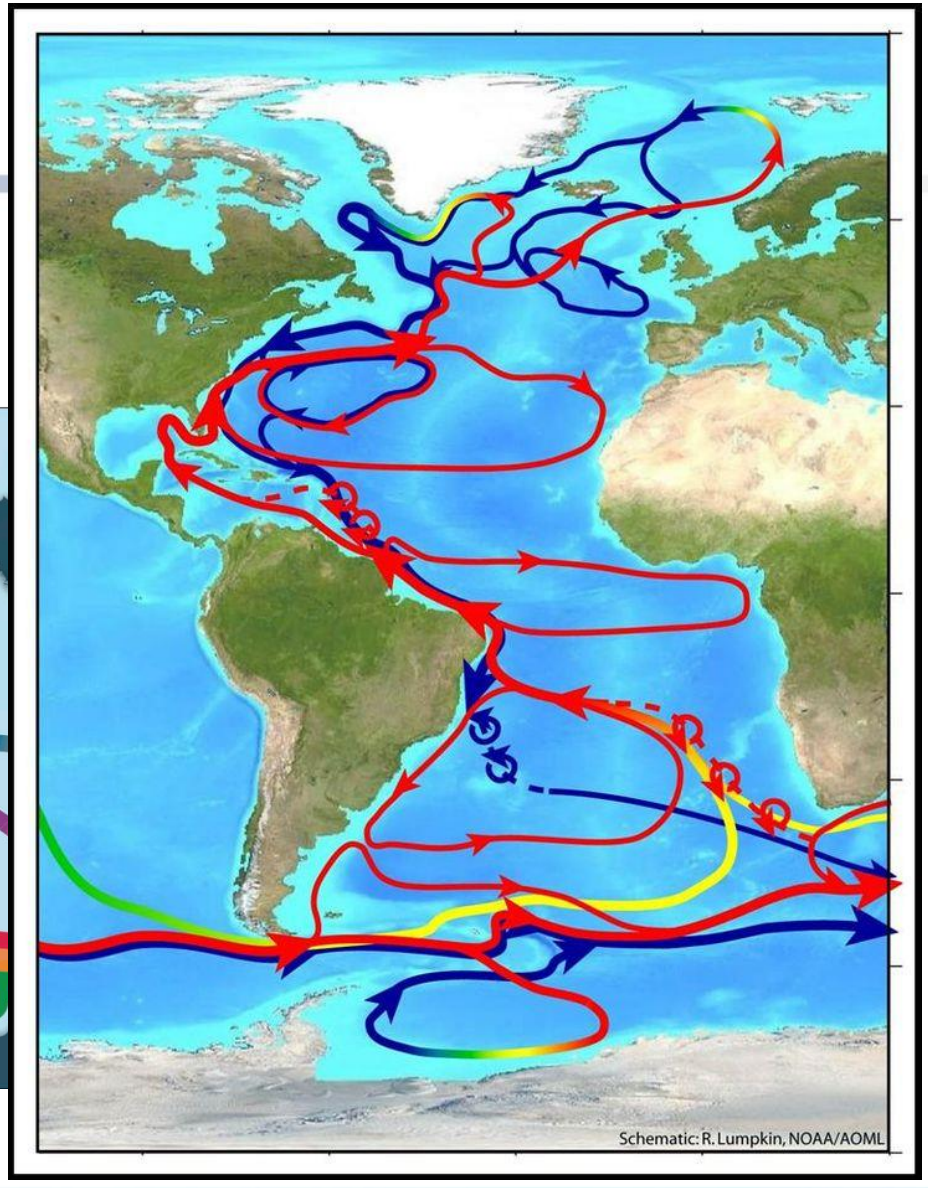


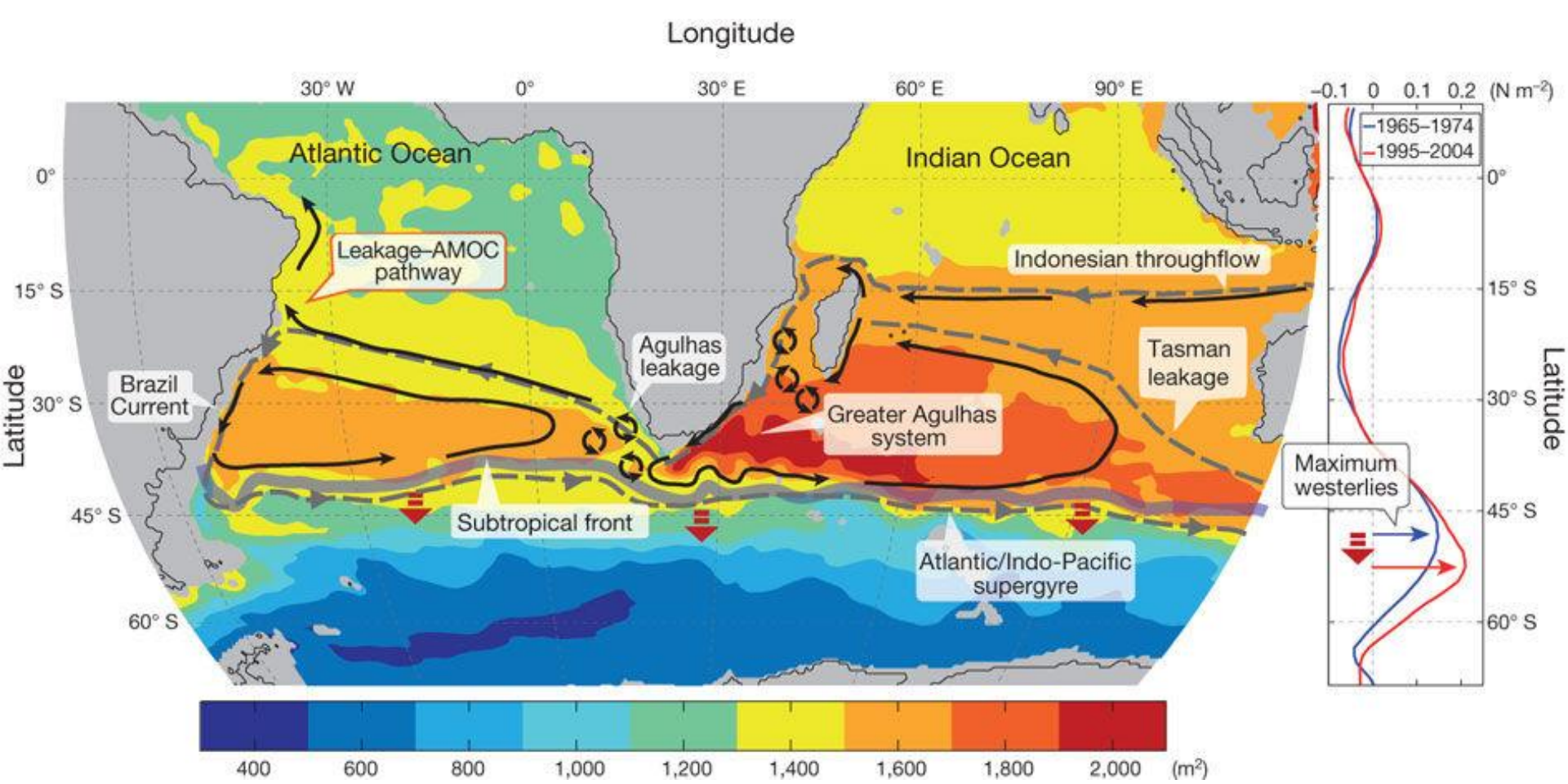
The Antarctic Circumpolar Current

Thermohaline Circulation

Linking the three oceans and understanding our connectivity!







Thus **changes to Agulhas Current** and subsequent leakage need to **monitored** in the long term to predict what will happen with our climate in a changing environment.
Shifts in the westerly wind belt, pushing the subtropical front southwards, are already impacting the amount of water leaking in to the South Atlantic!

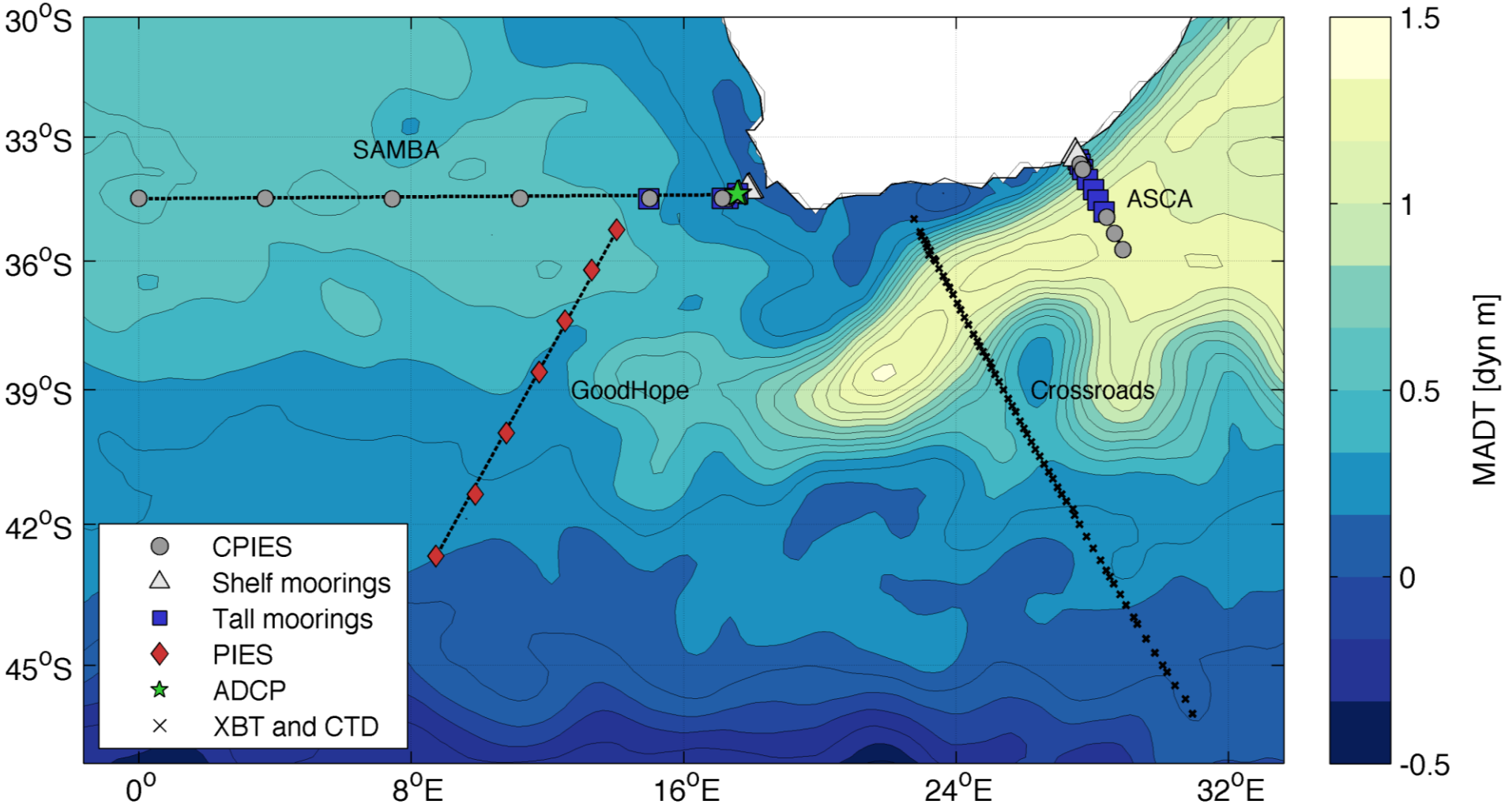
How do we measure the ocean currents around South Africa?

Fundamentals of monitoring a current system are two-fold:

1) **Measurements need to take place over a long period of time, to capture the changes, anomalies and dynamics**
2) **We need to measure the entire water column – from surface to seafloor**

So how do we do this?

Monitoring and Mooring Arrays



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Sea surface

Project: ASCA-1 Site " E " Mooring # 443

Radio/Strobe sn_____
Freq:_____
Argos sn_____
ID:_____
37" Elliptical buoy

100.m Microcat sn_____
200.m Microcat sn_____
300.m Microcat sn_____
400.m Microcat sn_____

Dyneema 4mm: (396.0 m)
mark Dyneema from top at:
1.0m-.101.0m.-201.0m.-301.0m.from top-Microcats

496.m 37" Elliptical+75khz ADCP sn_____

1.0m 3/8"chain+25lb. Weight
550.m Microcat sn_____

Wire:Section A = 247.0m
mark wire Aat: 50.0m. from top- Microcat

37" Hydro Float

750.m Microcat sn_____

Wire:Section B = 241.0m
mark wire B at: 1.0m. For Microcat

10-17" GLASS FLOATS
000.m (BAR) Nortek /Microcat sn_____/_____

Wire:Section C = 491.0m

5-17" GLASS FLOATS
500.m (BAR) Nortek /Microcat sn_____/_____

Wire:Section D = 491.5m

5-17" GLASS FLOATS
000.m (BAR) Nortek /Microcat sn_____/_____

Wire:Section E = 987.0m

5-17" GLASS FLOATS
000.m (BAR) Nortek /Microcat sn_____/_____

Wire:Section F = 208.8m

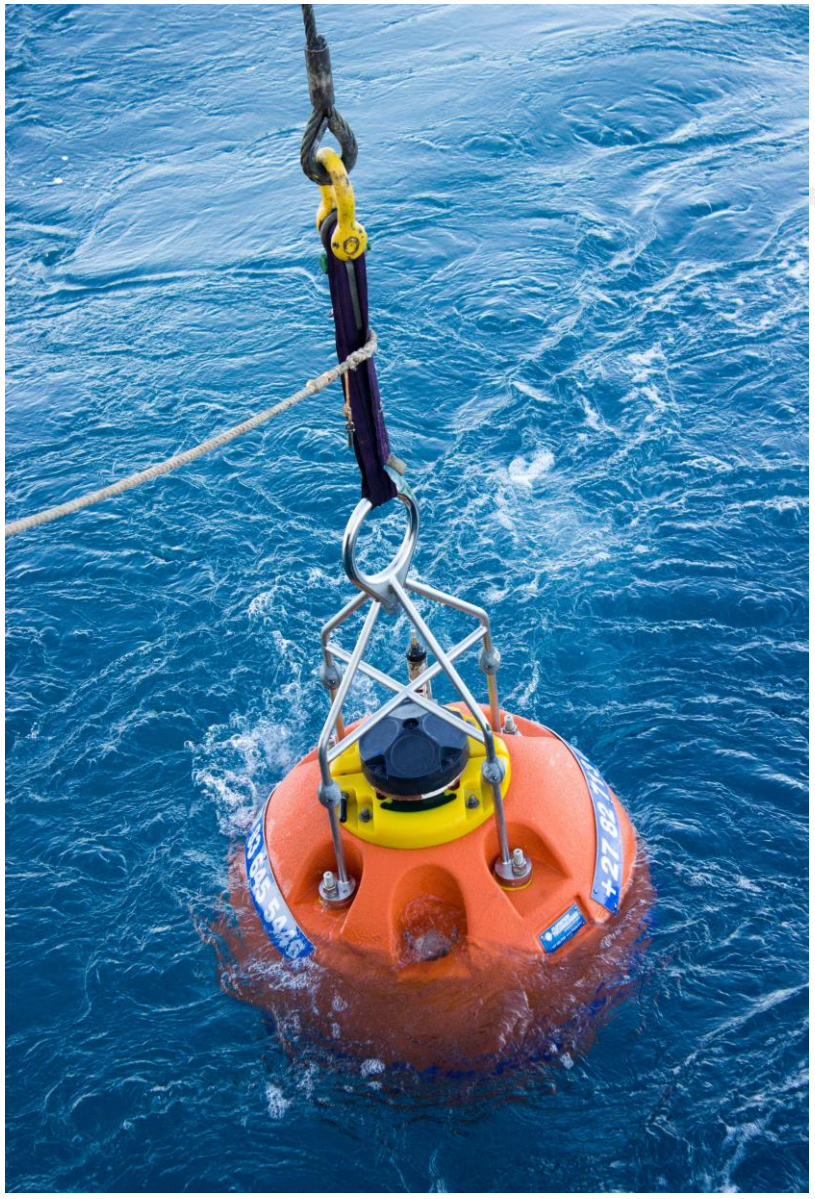
10-17" GLASS FLOATS

221.m Releases: sn_____
sn_____

Wire:Section G = 500.0m

3/8" chain = 5.0 m
730.m Minimum Anchor:WEIGHT in WATER 2016 Kg. / Dry weight=2318. kg.

Sea floor



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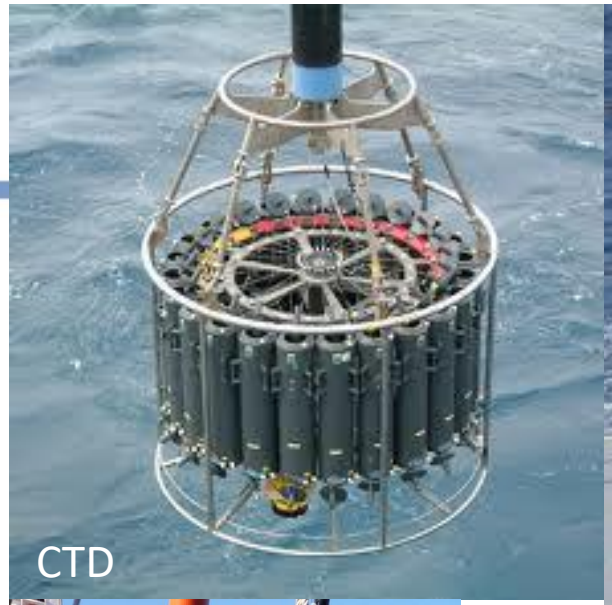
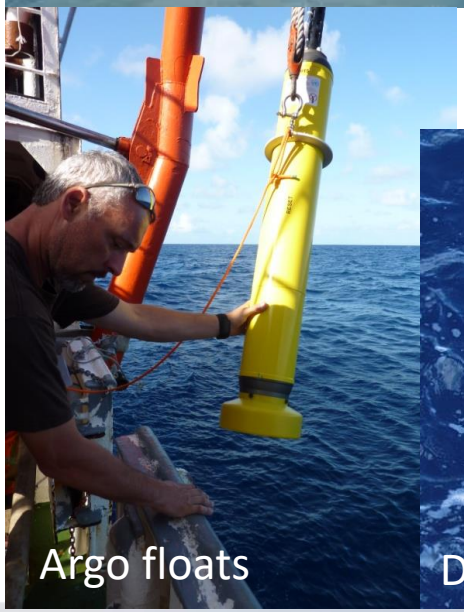
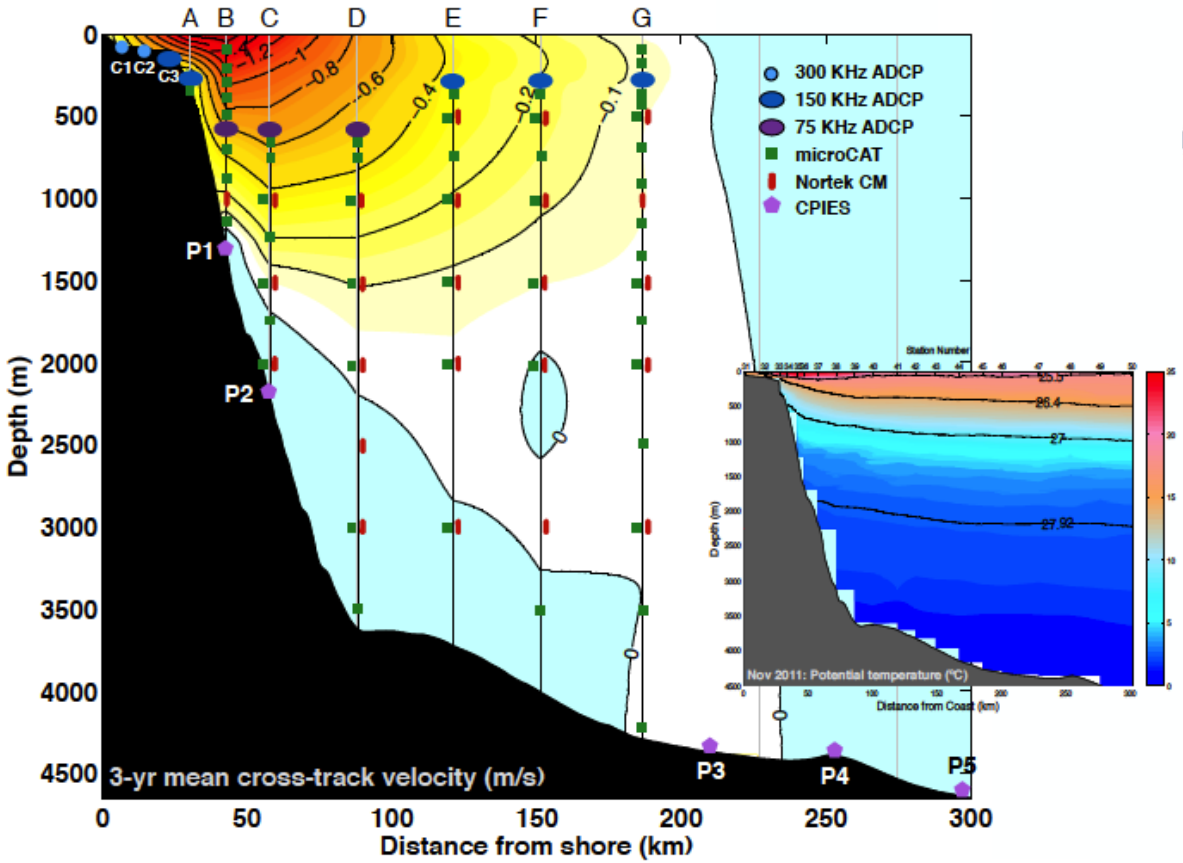
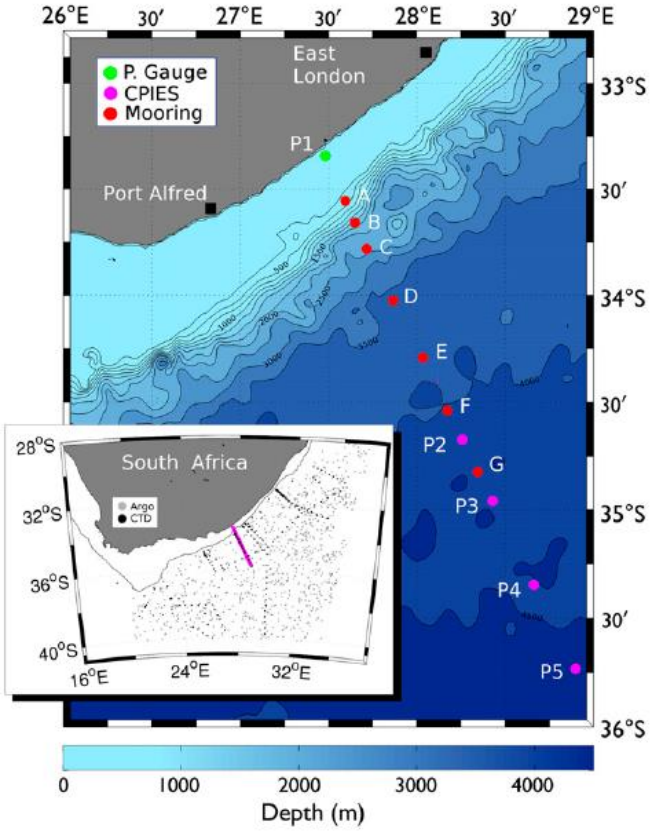

CTD


CPIES

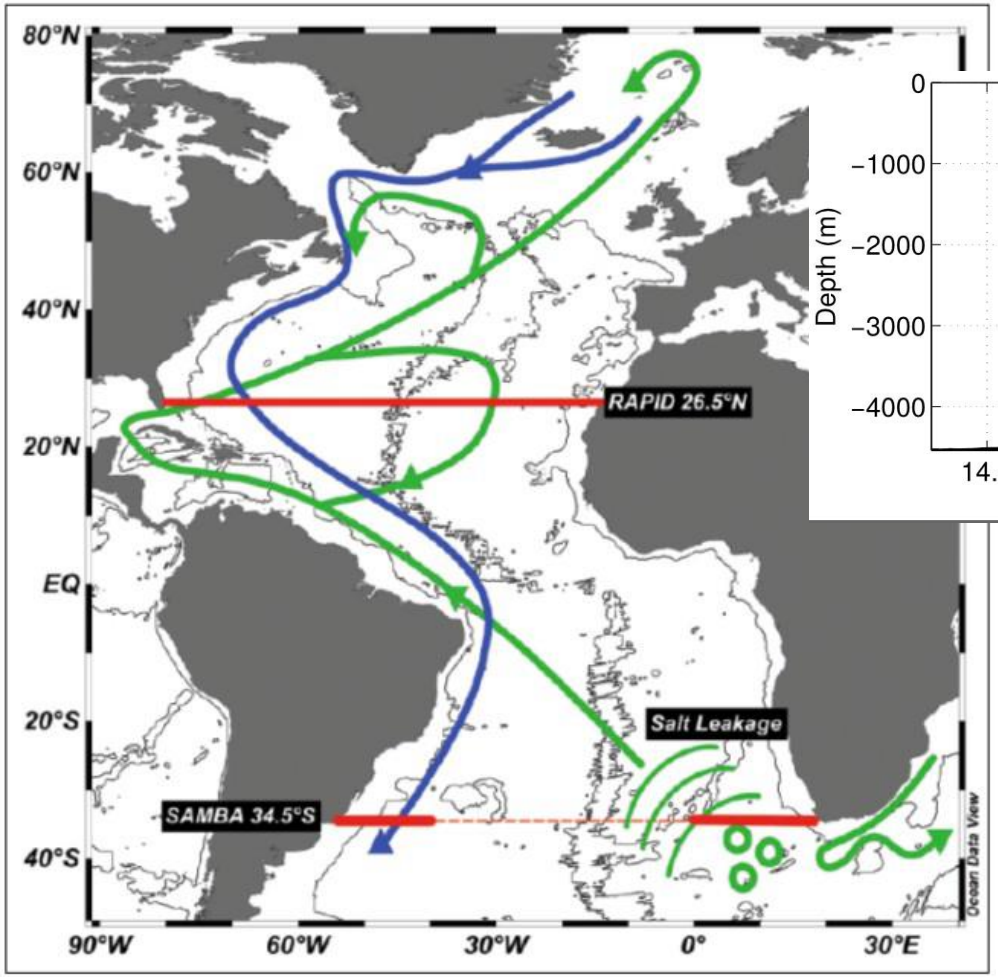

Argo floats

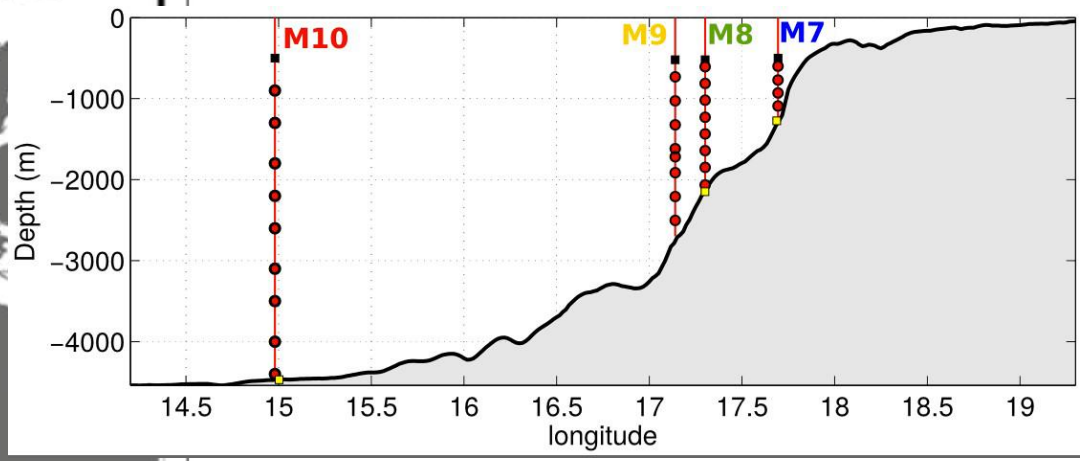

Drifters



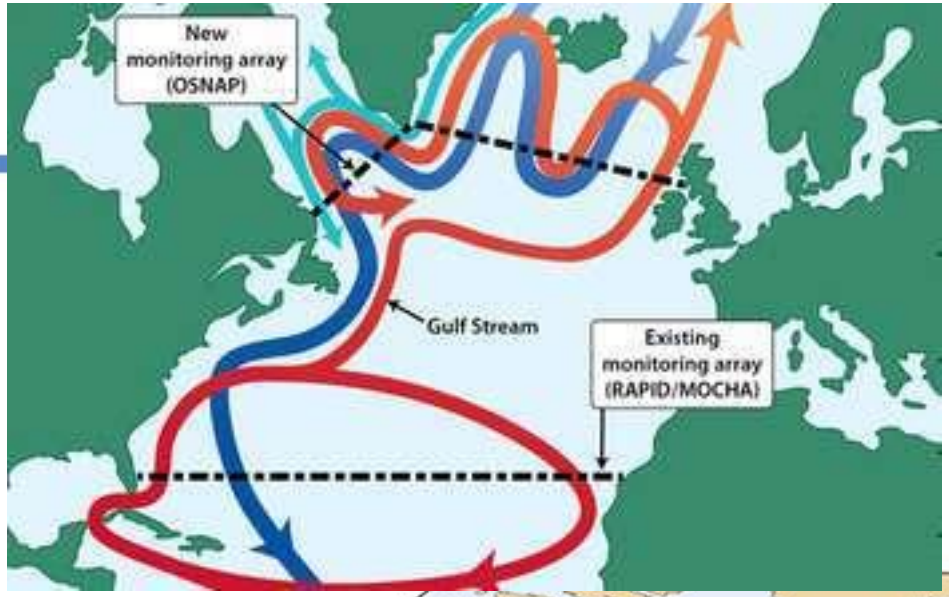


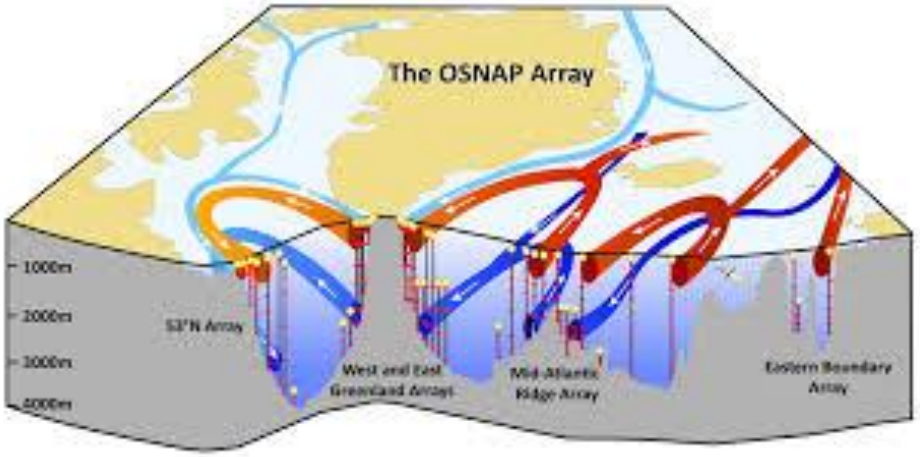
The Agulhas System Climate Array (ASCA) – crosses the Agulhas Current, and measures volume flow, heat and salt transport from the east coast of South Africa

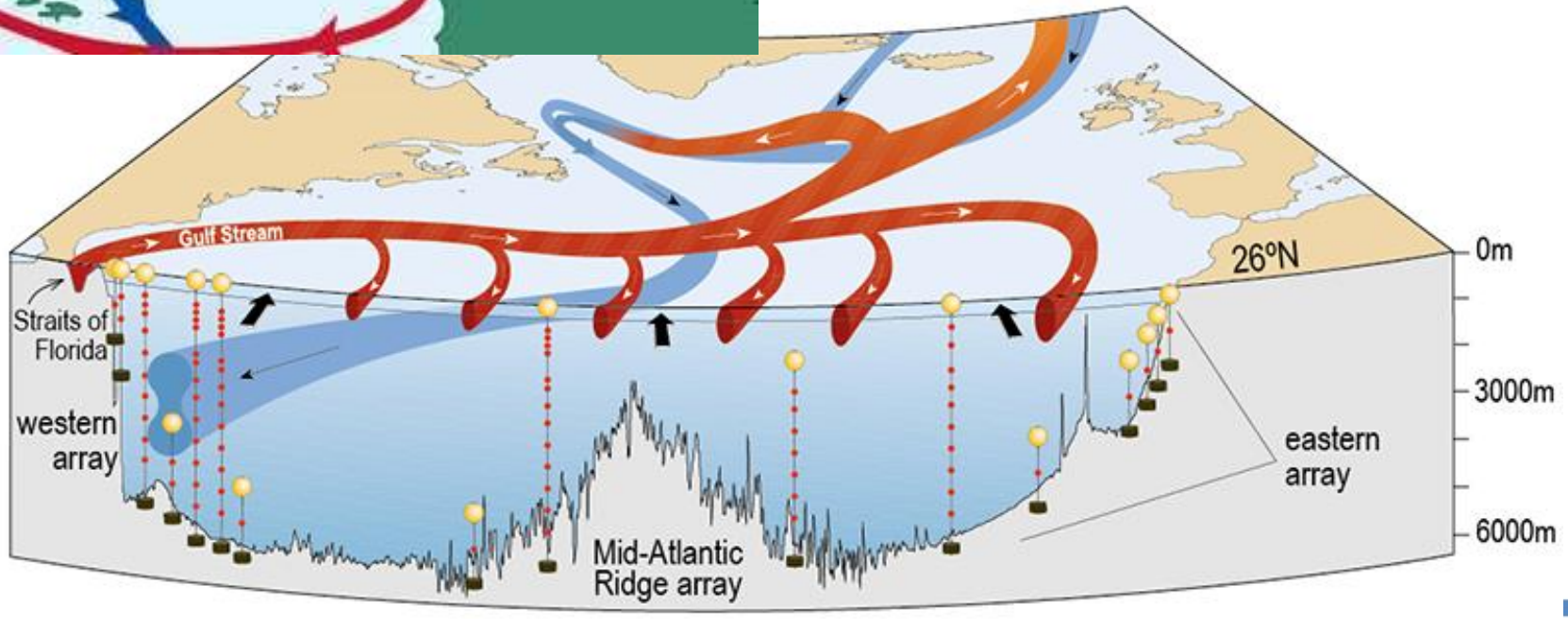




The South Atlantic Meridional Overturning Circulation (MOC) Basin-Wide Array (SAMBA), located directly west of Cape Town and measures the waters leaked in to the South Atlantic from the Greater Agulhas Current system







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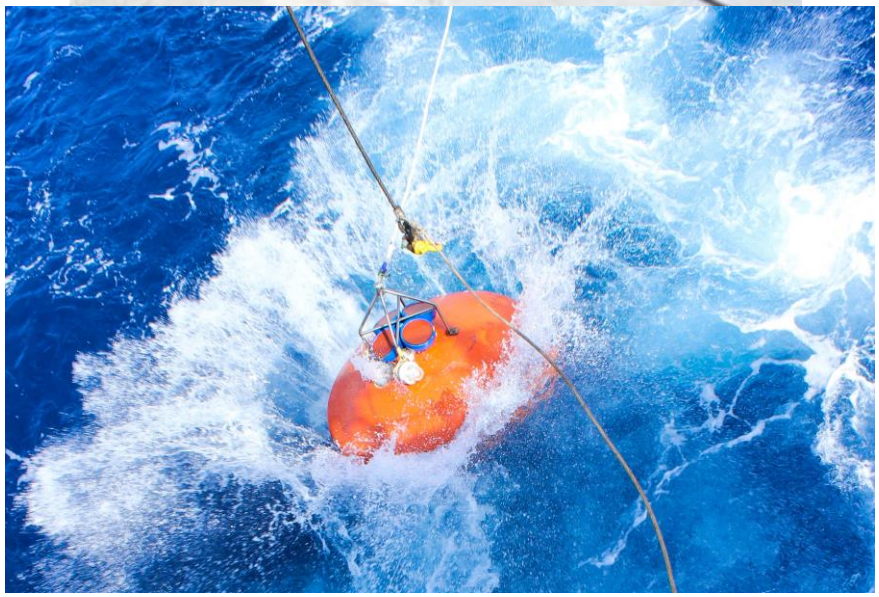
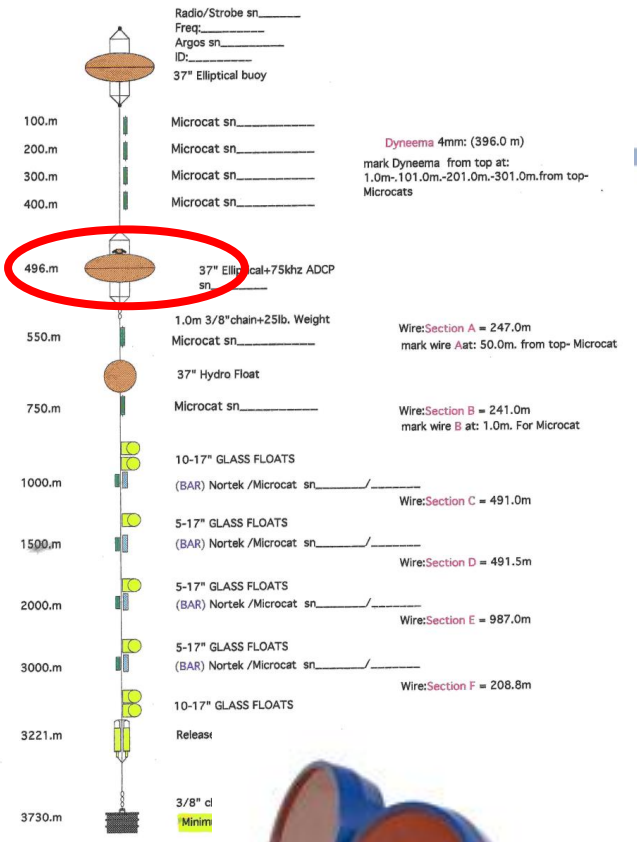
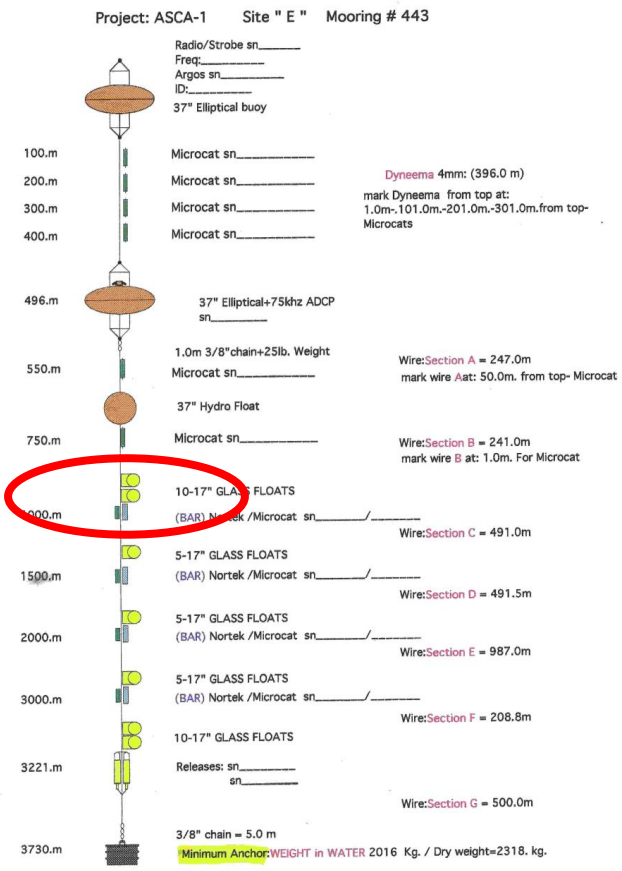
The Instruments

Acoustic Doppler Current Profiler (ADCP)

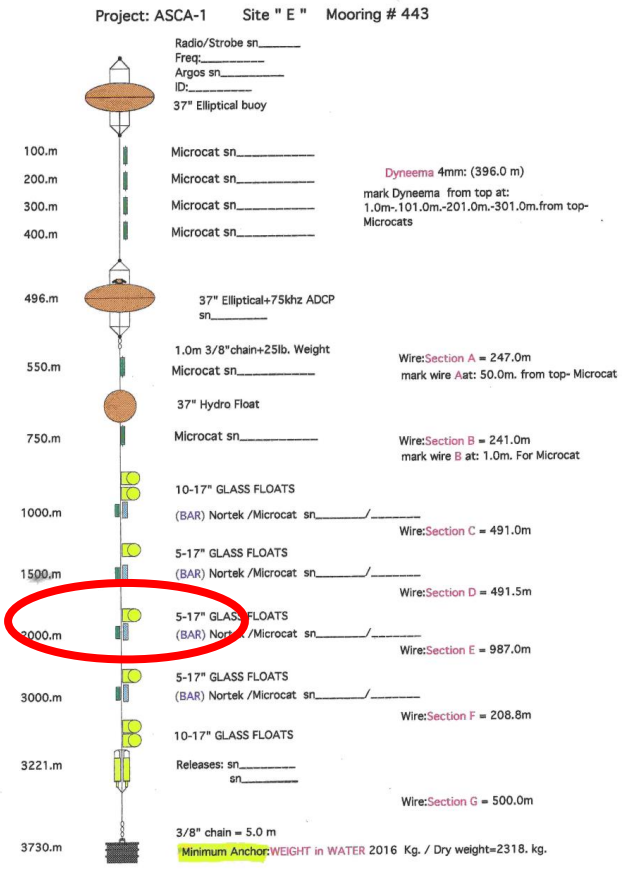




Single point current meters



MicroCats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Radio/Strobe sn_____
Freq:_____
Argos sn_____
ID:_____
37" Elliptical buoy
100.m Microcat sn_____
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Dyneema 4mm: (396.0 m)
mark Dyneema from top at:
1.0m-.101.0m.-201.0m.-301.0m.from top-Microcats
496.m 37" Elliptical+75khz ADCP sn_____
1.0m 3/8"chain+25lb. Weight
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1500.m (BAR) Nortek /Microcat sn_____/_____
Wire:Section D = 491.5m
5-17" GLASS FLOATS
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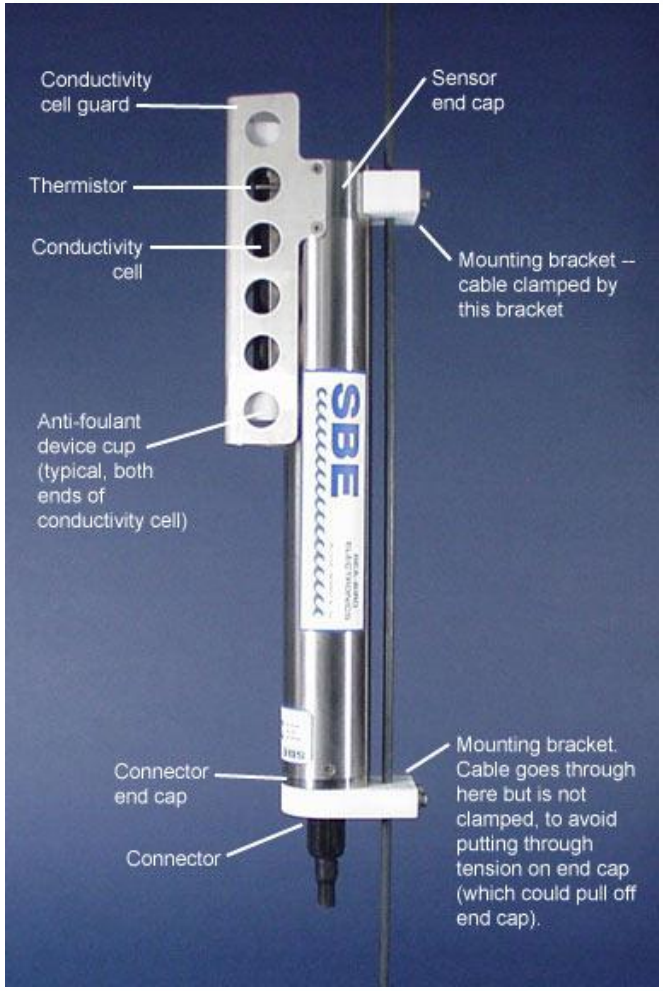
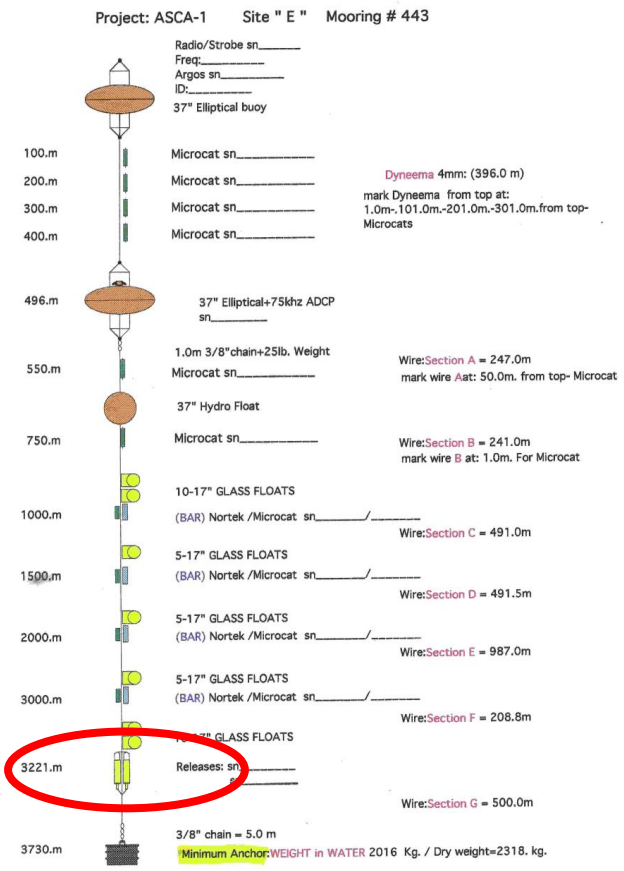
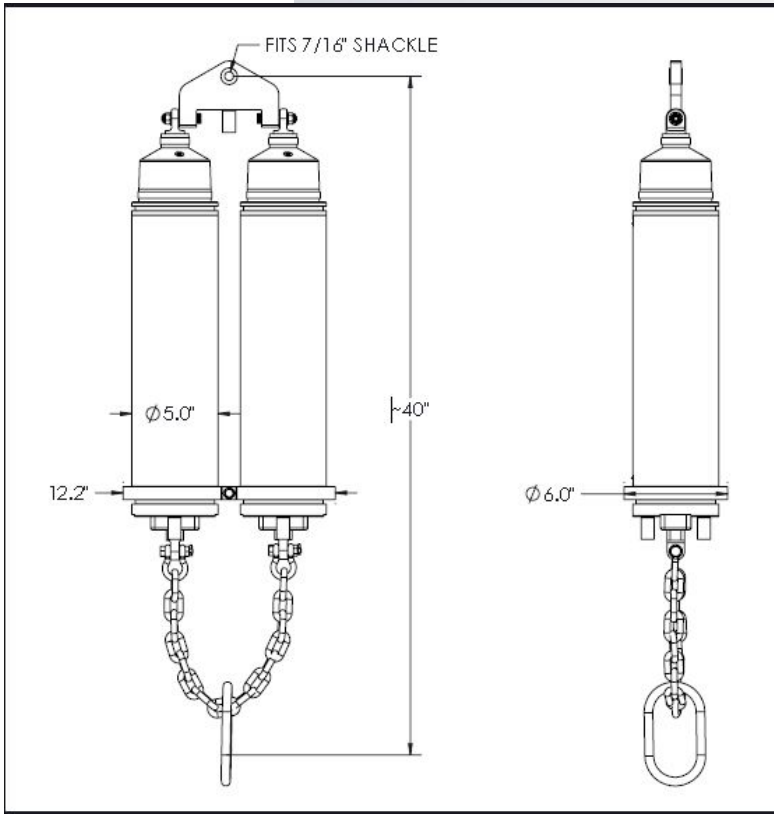
Wire:Section E = 987.0m
5-17" GLASS FLOATS
3000.m (BAR) Nortek /Microcat sn_____/_____
Wire:Section F = 208.8m
10-17" GLASS FLOATS
3221.m Releases: sn_____
sn_____
Wire:Section G = 500.0m
3730.m 3/8" chain = 5.0 m
Minimum Anchor:WEIGHT in WATER 2016 Kg. / Dry weight=2318. kg.


Conductivity cell guard
Sensor end cap
Thermistor
Conductivity cell
Mounting bracket -- cable clamped by this bracket
Anti-foulant device cup (typical, both ends of conductivity cell)
Connector end cap
Connector
Mounting bracket. Cable goes through here but is not clamped, to avoid putting through tension on end cap (which could pull off end cap).
SBE

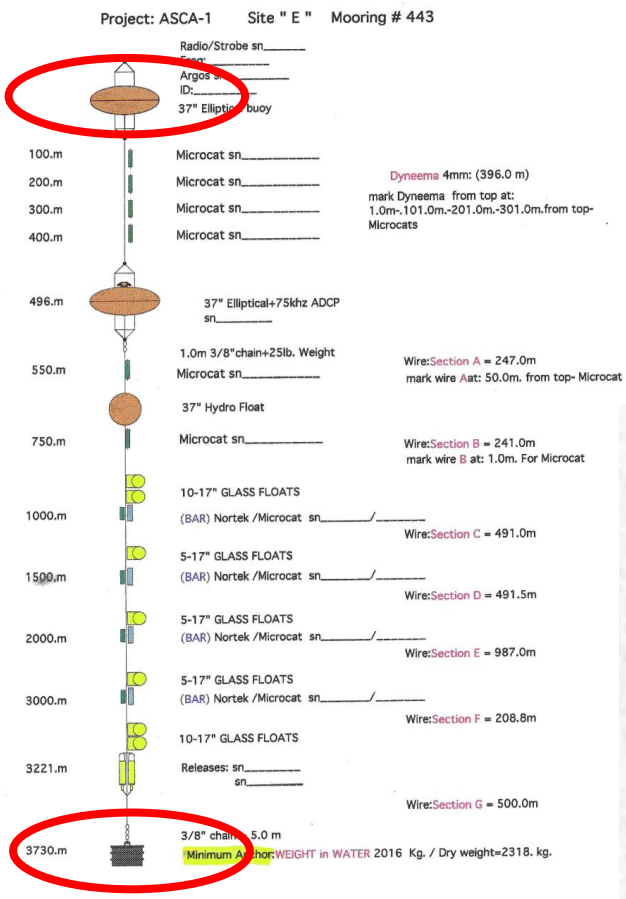

SBE

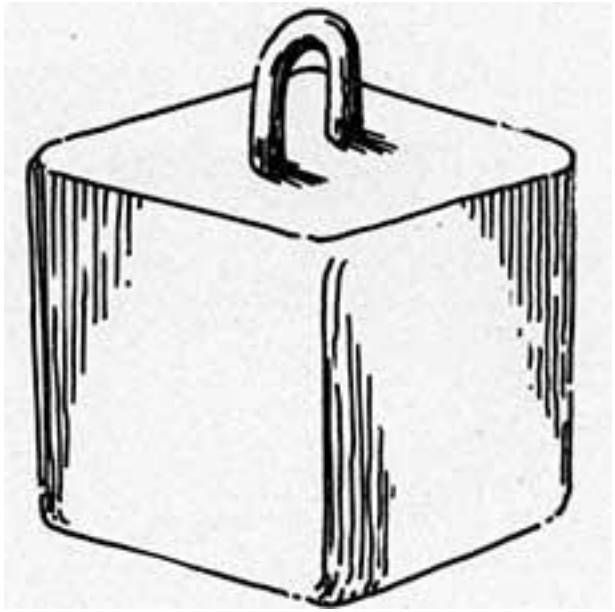
Acoustic Releases





Weight and Floatation





Thank you